

**AMENDMENT C**  
**(37 CFR 1.114)**

**IN THE CLAIMS:**

Please cancel Claims 6-10 without disclaimer to their content and without prejudice to their subsequent reintroduction into this or a future patent application.

**PLEASE ADD THE FOLLOWING NEW CLAIMS:**

Please add new Claims 11-22. The new claims are attached herein on separate sheets.

**REMARKS**

Pursuant to 37 C.F.R. §1.114, reconsideration of the instant application, as amended herewith, is respectfully requested. Entry of the amendment is requested.

New Claims 11-22 are presently pending before the Office. Claims 6-10 have been canceled. No new matter has been added. Support for the amendments can be found throughout the specification as originally filed. Applicants are not intending in any manner to narrow the scope of the originally filed claims.

The Examiner's Action mailed April 24, 2002 (Paper No. 21) and the references cited therein as well as the Advisory Action have been carefully studied by Applicants and the undersigned counsel. The amendments appearing herein and these explanatory remarks are believed to be fully responsive to the Action. Accordingly, this important patent application is believed to be in condition for allowance.

Applicants, after re-reviewing the past communications of the present application and the present office action, consider that it is quite important for the Examiner to notice the points of the present invention. Therefore, we decided to cancel the currently pending claims (Claims 6 to 10), and would like you to respond to the Office Action by adding the following new claims.

In the following, we would like to explain the characteristics of the present invention, and to discuss the points of each claim newly drafted, and the relationship between the points and the disclosures of the prior art references.

#### I. Novelty of the Present Invention

##### 1. Remarkable Characteristics of the Present Invention

(1) The present invention has a remarkable characteristics in utilizing the curing accelerating property of a tetrakisphenol compound (hereafter, TEP) itself represented by a general formula [I] in the curing of an epoxy resin, that is, utilizing the property of accelerating the curing (compared with the case where the amount of curatives is the same). Such a catalytic property of accelerating the curing shown by TEP was not known before the filing of the present application, and therefore it is evident that the invention utilizing the catalytic action of TEP itself in accelerating the curing has novelty and is non-obvious.

##### 2. Support from the Description in the Specification

The catalytic action of TEP in accelerating the curing is supported from the descriptions in the specification of the present invention.

(1) "the inventors of the present invention found that the tetrakisphenol compound itself has an excellent catalytic action for curing epoxy resins."

(p. 14 line.6 from the bottom of the English specification).

This description indicates that TEP has a catalytic property of curing epoxy resin by itself, that is, TEP has a property of accelerating the curing by itself.

(2) "((~) and are curable by just heating them up to a certain temperature) to promptly produce a cured-product. The curing of the epoxy resin should not be initiated at a temperature below 80 °C or around. However, the epoxy resin starts curing rapidly when temperature is raised to a range of from 100 to 130 °C, which is normally desired for curing." (page 14, lines 7 to 12 of the English specification).

This description shows a catalytic action of TEP itself, a host compound of a clathrate, in accelerating the curing and explains the action of TEP itself that has just lost its guest by having

released a curative, a guest compound, from a clathrate, wherein a TEP is a host compound, and further explains that a curative, a guest, is released from a clathrate when heating the clathrate comprising a curative as a guest compound and a TEP as a host compound to a certain temperature (around 100 to 130 °C), therefore free TEPs (hosts having no guests) and non-clathrated curatives are present in the reaction system, and the free TEPs accelerates the curing of an epoxy resin by non-clathrated curatives, and "**promptly produce a cured-product**" and as a result, "**starts curing rapidly.**"

(3) "By using the epoxy resin composition according to the present invention containing a tetrakisphenol compound, various curing reactions can proceed faster and smoothly even under a mild condition, which allow to obtain stable cured products, because of the excellent catalytic activity of a tetrakisphenol compound for curing epoxy resins, and the curing property of a resin composition can be extremely improved by using the inventive epoxy resin composition when compared to the curing by using a curative only." (page 15, lines 8 to 15 of the English specification).

The description cited above clearly indicates that TEP itself has a catalytic property of the curing of an epoxy resin, that is, TEP itself has a property of accelerating the curing. It is also mentioned that the curing reactions can proceed faster and smoothly even under a mild condition due to the free TEPs, compared with a curing reaction using curatives alone.

(4) Examples 21 and comparison example 20 of the specification demonstrate that a TEP acts as a catalyst in the reaction system of curing epoxy resin (see also Table 19).

More concretely, in example 21, while the pot life of a epoxy resin composition to which non-clathrated curatives 1B2MZ and the free TEPs are added is only one hour or so (12500 → 23500; 1h in the leftmost column of Table 19: "the viscosity of resin (CP/25°C))" by the catalytic action of a TEP itself in the curing of an epoxy resin, the pot life of a resin when only a non-clathrated curatives 1B2MZ is used is about 10 hours (10200 → 20400; 10h in the fourth column

from the left most of Table 19: "the viscosity of resin (CP/25°C)". In the specification of the present application, the pot life of a epoxy resin refers to the time before the initial viscosity of a resin (cp/25°C) doubles. As shown above, the fact the the pot life will be 1/10 when free TEPs are added to non-clathrated curatives 1B2MZ means that and it is experimentally demonstrated that the free TEP itself has a catalytic action in the curing of epoxy resins.

Such a property of accelerating the curing of an epoxy resin composition that a TEP itself has is a characteristic of TEP, and cannot be found in other host compounds. The contrast is shown in Table 19 as well. For comparison, the results of the experiment using a host (phenol) described in the prior art references together with non-clathrated curatives 1B2MZ are given in the rightmost column of Table 19: "Viscosity of Resin (CP/25°C)", the pot life when free phenol is replaced with TEP is 8 hours (9000 → 18400), and there is little difference compared with the pot life of using a non-clathrated curative 1B2MZ alone (10 hours).

In the experiment of the example 21, the changes of viscosity with time were measured by adding 1B2MZ and TEP to the base resin UVR-6410, mixing at 25°C for 10 minutes, and further leaving it at 25°C for 20 minutes. Considering the conditions where experiments were carried such as: adding 1B2MZ and TEP to UVR-6410 without producing clathrates comprising 1B2MZ and TEP, and carrying out the experiments at as a low temperature condition as 25°C where clathrate compounds cannot be formed with 1B2MZ as a guest and TEP as a host due to the low temperature, and 1B2MZ, a guest, cannot be released from a clathrate compound comprising 1B2MZ as a guest and TEP as a host, there is no other way to account for the experimental result by concluding that it is a common knowledge for the one in the art that 1B2MZ, a non-clathrated curative, and free TEP contribute to the curative reaction in the experiments in example 21. In other words, it would be unacceptable to consider that clathrate compounds were produced with TEP as a host and thereby accelerated the curing reaction of epoxy resins.

### 3. Curative Property of a Clathrate Comprising a TEP as a Host and a Curative as a Guest

(1) In order to cure an epoxy resin by adding and mixing a clathrate comprising a TEP as a host and a curative as a guest in a non-curative epoxy resin, it is necessary to contact a guest curative with a non-curative epoxy resin by heating a clathrate. When a guest curative is released

from a clathrate, a TEP, a host compound having just released a guest is present in the reaction system other than non-curing epoxy resins and non-clathrate curatives, and the free TEP acts as a curing accelerator as mentioned above. This is due to a catalytic action accelerating the curing that a TEP itself has, and can never be obtained by a clathrate comprising a host compound other than TEP and a curative as a guest. This is the effect characteristic of the present invention, and this effect is considered to be a special effect that the one in the art would not have expected.

As already mentioned in 2. (2), this is supported by the description of the specification of the present application, repeated below.

"((~) and are curable by just heating them up to a certain temperature) to **promptly** produce a cured-product. The curing of the epoxy resin should not be initiated at a temperature below 80 °C or around. However, the epoxy resin **starts curing rapidly** when temperature raised to a range of from 100 to 130 °C, which is normally desired for curing." (page 14, lines 7 to 12 of the English specification).

That is, the description indicates the catalytic action of TEP itself as a host compound of a clathrate in accelerating the curing, and explains the effect of TEP itself having just lost a guest by having released a curative, a guest compound, from a clathrate comprising a TEP as a host compound, and further explains that; when a clathrate comprising a curative as a guest compound and a TEP as a host compound is heated to a certain temperature (around 100~130°C), and the clathrate then release a curative, a guest from the clathrate, and thereby free TEPs and non-clathrate curatives are present in the reaction system, and the free TEPs accelerate the curing of epoxy resins by the non-clathrate curatives, "**promptly produce a cured-product**", and lead to "**starts curing rapidly**".

(2) The curative comprising a TEP as a host and a curative as a guest in the present invention has other remarkable properties such as the increase of stability as a one-pack mixture and the significant extension of pot life than the catalytic properties of TEP itself in accelerating the curing after having released a curative as a guest, which cannot be obtained by clathrates produced by using a host compound other than TEP and a curative as a guest. That is, the curative comprising a clathrate having a TEP as a host

and curative as a guest in the present invention has an excellent moisture resistance when preserved at room temperature, has hardly underwent decomposition and sublimation, shows significant extension of a pot life of an epoxy resin when mixed with a non-curing epoxy resin, and therefore the curing of an epoxy resin at room temperature can be prevented for the long time. This effect is a remarkably useful from a practical standpoint.

The effect has a support form the specification, that is,

"And, the resin compositions according to the present invention containing the clathrate as a curatives or a curing accelerator as described above have several excellent thermal properties. For the thermal properties of the resin composition, three properties, including the thermal stability at an ordinary temperature (stability as a one-pack mixture)(...). The uncured epoxy resins compounded with the curative and the curing accelerator according to the present invention are very stable (having good stability as a one-pack mixture) under an ordinary temperature" (page 13, line 4 from the bottom, to page 14, line 7 of the English specification).

Moreover, the effect regarding the one-pack stability of the clathrate in the present invention comprising a TEP as a host and a curative as a guest, has been demonstrated in the description of the Examples in the present specification. That is, detailed description is found in Examples 2, 3, 4 and 5 of the present specification, and a comparison with the clathrate compound of the prior art has been conducted in Comparison Example 2, 3, 4 and 5 (International Publication pages 28 to 35, English specification pages 29 to 37).

The following is a specific comparison of pot life (one-pack stability) at room temperature (25 °C):

1) Example 2 and Comparison Example 2 (Table 4)

Example 2	; Sample No. 32	TEP	18 hours
Comparison Example 2;	Sample No. 53	BHC	9 hours
	Sample No. 54	BPA	5 hours

2) Example 3 and Comparison Example 3 (Table 5)

Example 3 ; Sample No. 24 TEP 180 hours  
Comparison Example 3; Sample No. 50 BHC 12 hours

3) Example 4 and Comparison Example 4 (Table 6)

Example 4 ; Sample No. 10 TEP 180 hours  
Sample No. 11 TEOC more than 180 hours  
Comparison Example 4; Sample No. 48 BHC 5 hours  
Sample No. 49 BPA 2 hours

4) Example 5 and Comparison Example 5 (Table 7)

Example 5 ; Sample No. 36 TEP 180 hours  
Sample No. 38 TEOC more than 180 hours  
Comparison Example 5; Sample No. 55 BPS 36 hours

From the results shown above, it has been demonstrated that the clathrate of the present invention comprising a TEP as a host and a curative as a guest is substantially superior in one-pack stability compared to the conventional clathrate comprising bisphenol or the like (BPA, BPS) aside from TEP as a host and a curative as a guest. Therefore, it can be said that this effect of the clathrate in the present invention is a notable effect that cannot be predicted by those skilled in the art.

(3) As described above, the clathrate of the present invention comprising a TEP as a host and a curative as a guest has the above-mentioned (1) curing accelerating action of the TEP itself after the release of guest curative, and (2) effect of one-pack stability of the clathrate as well, and these effects are combined to show very excellent heating property. To be precise, when a clathrate comprising a TEP as a host in the present invention is combined to a non-curing epoxy resin, it is very convenient for use since the stability (one-pack stability) at room temperature is high, and curing does not start for a long time (pot life is long), and has a special effect that cannot be obtained when host compound aside from TEP is used, which is that when there is a necessity to cure, curing starts at

once in a particular temperature range by heating. It is clear that non-obviousness of an invention regarding a clathrate comprising the TEP as a host and a curative as a guest, and its use can be admitted.

#### 4. Curing property of a clathrate comprising a TEP as a host and a curative as a guest

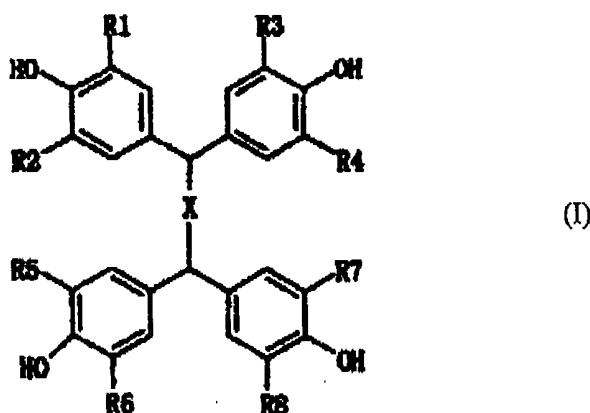
The curing property of the clathrate comprising a TEP as a host and a curative as a guest has been described in detail in the above-mentioned 3, and it is easily understood by those skilled in the art that the same special effect can be obtained also from the curing property of a clathrate comprising a TEP as a host and a curing accelerator (aside from TEP) as a guest. That is, when a clathrate comprising the TEP of the present invention as a host and a curing accelerator (aside from TEP) as a guest is mixed to a non-curing epoxy resin, it is very convenient for use since the stability (one-pack stability) at room temperature is high, and curing does not start for a long time (pot life is long), and has a special effect that cannot be obtained when host compound aside from TEP is used, which is that when there is a necessity to cure, the curing accelerator (aside from TEP) which is a guest is released by heating in a particular temperature range, the curing acceleration action of free TEP and the curing acceleration action of curing accelerator (aside from TEP) of the guest multiplies its action, and curing starts rapidly. It is clear that non-obviousness of an invention regarding a clathrate comprising the TEP as a host and a curing accelerator (aside from TEP) as a guest, and its use can be admitted.



## II. New claims added

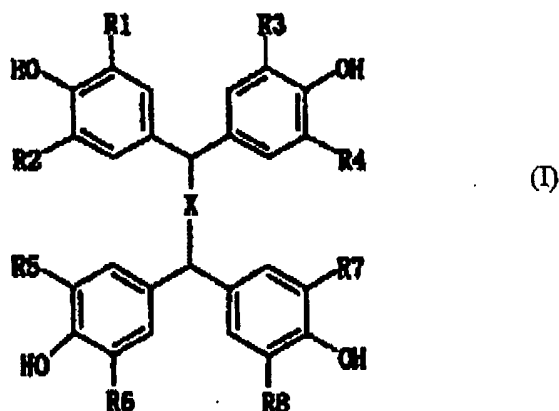
Claims 11 to 14

11. (Newly added) An epoxy resin composition comprising a non-curing epoxy resin, a non-clathrated curative agent reacting with an epoxy group of the epoxy resin to cure the resin, and a tetrakisphenol compound represented by a general formula (I) as a curing accelerator catalyst,



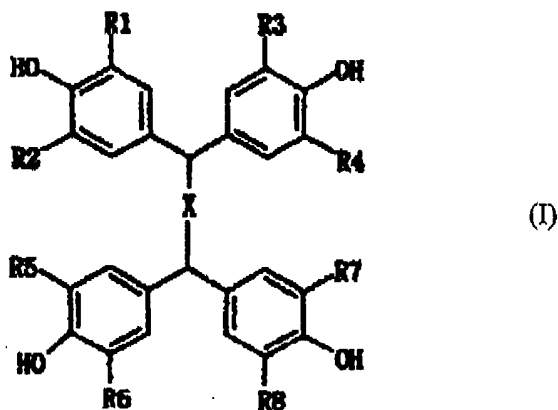
wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

12. (Newly added) The epoxy resin composition according to claim 11, wherein the content of the tetrakisphenol compound represented in general formula (I) is a range from 0.001 to 0.1 mole based on 1 mole of the epoxy group,



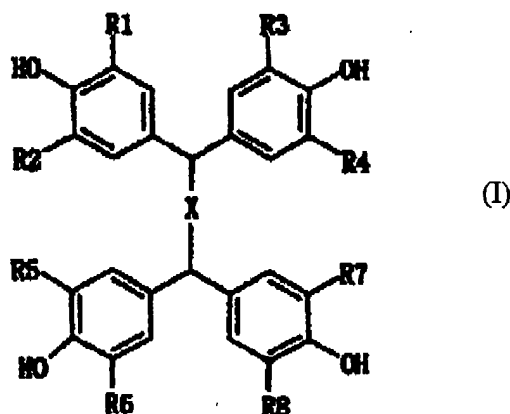
wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

13. (Newly added) A method for curing an epoxy resin comprising a step of mixing a non-clathrated curative agent reacting with an epoxy group of the epoxy resin to cure the resin, and a tetrakisphenol compound represented by a general formula (I) as a curing accelerator catalyst with a non-curing epoxy resin,



wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

14. (Newly added) A method for curing an epoxy resin according to claim 13, wherein the content of the tetrakisphenol compound represented in general formula (I) is a range from 0.001 to 0.1 mole based on 1 mole of the epoxy group,



wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

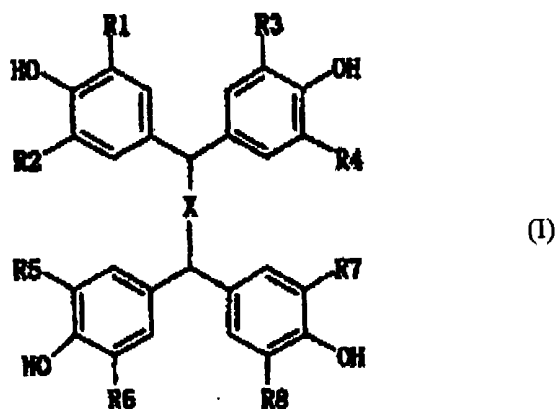
Claims 11 to 14 are the inventions focusing on curing accelerating properties of TEP itself, and are characterized in that TEP as a curing accelerator and a non-clathrated curative are

elements. That is, the free TEP used in the inventions of claims 11 to 14 is characterized in having the curing accelerating property itself, and the property that the TEP shows and a method for curing an epoxy resin using the property were unknown. Therefore, it is reasonable that there is no description and teaching as to the curing accelerating property of TEP itself in the references cited by the Examiner in the Office Action.

At the time of filing the present application, it was known that a TEP acts as a curing agent for an epoxy resin as described in the specification "tetrakisphenol compound that forms the said clathrate is a compound that is conventionally known as an addition-type curative." (p. 14 line 9 from the bottom of the English specification). However, as the performance of TEP as a curative is unsatisfactory, it has not been in practical use. As aforementioned, it was unknown that a TEP accelerates the curing by itself. Further, it was also unknown that a TEP accelerates the curing of epoxy resin in a catalytic amount. That is, the core of the present invention described in claims 11 to 14 is the use of the accelerating action of the free TEP it self in curing an epoxy resin, and it is obvious that the invention wherein the accelerating action of the free TEP it self in curing an epoxy resin is specifically claimed has novelty and is non-obvious.

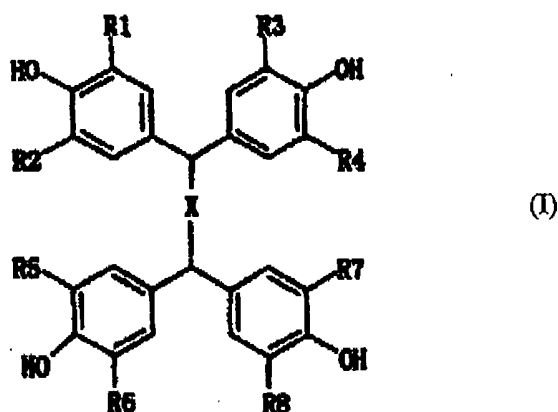
#### Claims 15 to 22

15. (Newly added) A curative for epoxy resin, comprising a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a compound reacting with an epoxy group to cure an epoxy resin,



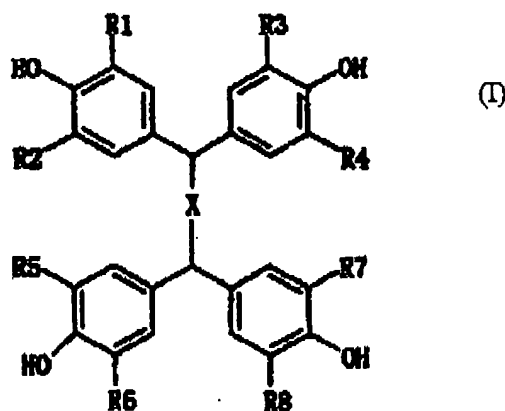
wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

16. (Newly added) A curing accelerator for epoxy resin, comprising a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a compound accelerating the curing of a compound reacting with an epoxy group to cure an epoxy resin,



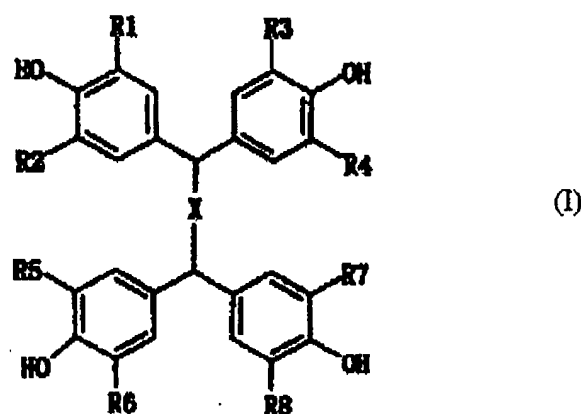
wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

17. (Newly added) An epoxy resin composition, comprising a non-curing epoxy resin, and a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a compound reacting with an epoxy group of the epoxy resin to cure the resin,



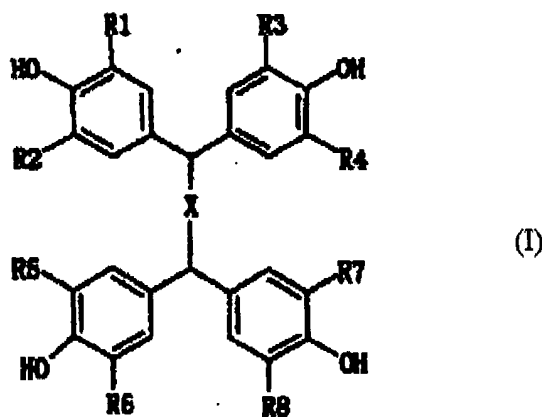
wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

18. (Newly added) An epoxy resin composition, comprising  
 a non-curing epoxy resin;  
 a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a compound reacting with an epoxy group of the epoxy resin to cure the resin; and  
 a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a compound accelerating the curing of a compound reacting with an epoxy group to cure an epoxy resin,



wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

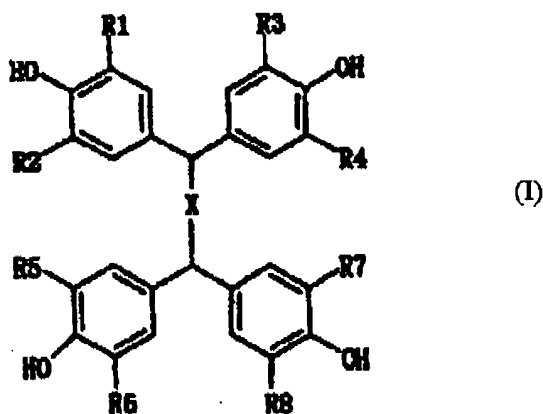
19. (Newly added) An epoxy resin composition according to claim 17 or 18, wherein the content of a tetrakisphenol compound represented by a general formula (I) in the clathrate is in a range of from 0.001 to 0.1 mole based on 1 mole of the epoxy group.



wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

20. (Newly added) A method for curing an epoxy resin composition comprising the steps of:

a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a compound reacting with an epoxy group of the epoxy resin to cure the resin is added and mixed to a non-curing epoxy resin, and then the mixture is heated to a predetermined temperature,

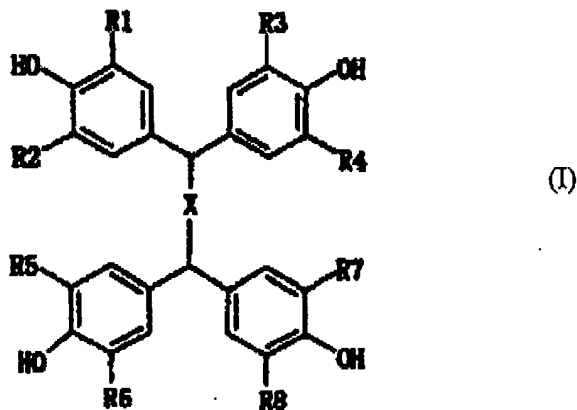


wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

21. (Newly added) A method for curing an epoxy resin composition comprising the steps of:

a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a compound reacting with an epoxy group of the epoxy resin to cure the resin, and

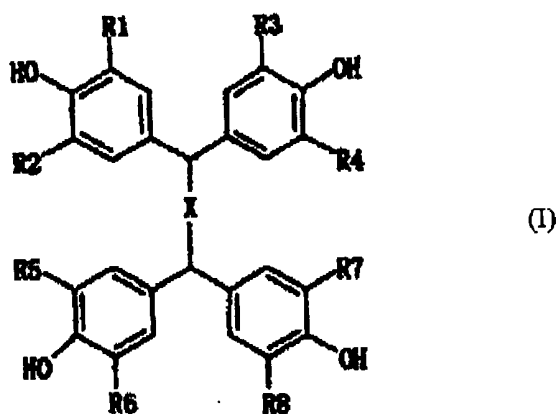
a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a compound accelerating the curing of a compound reacting with an epoxy group to cure an epoxy resin are added and mixed to a non-curing epoxy resin, and then the mixture is heated to a predetermined temperature,





wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

22. (Newly added) The method for curing an epoxy resin composition according to claim 20 or 21, wherein the content of the tetrakisphenol compound represented by a general formula (I) in the clathrate is in a range of from 0.001 to 0.1 mole based on 1 mole of the epoxy group.



wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

Claims 15 to 22 recites the invention focusing on the combined actions of the curing accelerating action of the TEP itself after the release of a guest curative (curing accelerator) and a one-pack stability action of a clathrate comprising TEP as a host. It is characterized in that the element is a clathrate comprising a TEP as a host and a curative (curing accelerator) as a guest.

That is, the clathrate of the present invention comprising a TEP as a host and a curative (curing accelerator) a guest described in claims 15 to 22 has a curing accelerating action of the TEP itself after the release of guest curative (curing accelerator) and a one-pack stability action

of a clathrate, and these actions are combined to show a very excellent heat property. In particular, when a clathrate in the present invention comprising a TEP as a host is combined to a non-curing epoxy resin, it is very convenient for use since the stability (one-pack stability) at room temperature is high, and curing does not start for a long time (pot life is long), and is characterized in that it has a special effect that cannot be obtained when host compound aside from TEP is used, which is that when there is a necessity to cure, curing starts rapidly in a particular temperature range by heating. This property indicated by the clathrate comprising a TEP as a host has not been known till today, and the method of curing epoxy resin using said property has not been known either. As a matter of course, no description regarding curing acceleration action of a clathrate comprising said TEP as a host is found in the references cited by the Examiner in the Action, and there is nothing that teaches this.

To date, it had already been known when the present application was filed, to cure non-curing epoxy resin by use of a clathrate wherein a guest curative is made to a clathrate by a host compound aside from TEP. However, as the clathrate of the present invention comprising a TEP as a host, the clathrate as a very practical curative for epoxy resin wherein the stability (one-pack stability) at room temperature is high and curing does not start for a long time (long pot life) had not been known. That is, the essence of the present invention described in claims 15 to 22 is that the stability (one-pack stability) at room temperature is high and curing does not start for a long time (pot life is long), thereby enabling the use of the clathrate as a very convenient curative for epoxy resin, and is clear that novelty and non-obviousness is found in the invention particularly claiming this clathrate very excellent in its practicability.

In claims 19 and 22, the number of moles of TEP in a clathrate based on 1 mole of the epoxy group is determined, since the characteristic of the present invention is found, in the use of TEP having a catalysis of curing acceleration by itself, and this can easily be understood by those skilled in the art. Moreover, claims 19 and 22 limits the content of TEP in the clathrate as being 0.001 - 0.1 mole based on 1 mole of the epoxy group, to particularly clarify that the curing acceleration action of a non-curing epoxy resin can be exhibited well enough, even when the amount of use of TEP is the catalysis amount.

### III. Final Office Action

#### 1. Obviousness alleged by the Examiner

The Examiner has rejected claims 6 to 10 under 35 U.S.C. 103 (a) as being obvious due to the existence of the prior art references JP5-194711, JP6-329570 and US 5,364,977 (Asai et al., Nippon Soda Co., Ltd.). To be more precise, the Examiner states that it is obvious to employ the tetrakisphenol (hereinafter TEP) described in JP6-329570 and Asai et al. as the clathrate compound used for curing an epoxy resin described in JP5-194711, in order to optimize the chemical stabilization.

#### 2. New claims 11 to 14

The new claims 11 to 14 recite the invention using catalysis of the TEP itself in a curing acceleration, wherein the TEP is used not as a host compound of the clathrate but as a catalyst for curing acceleration. It is an invention where clathrate compound is not used, and therefore, it is clear that it is not obvious over the prior arts such as JP5-194711 and the like mentioned above.

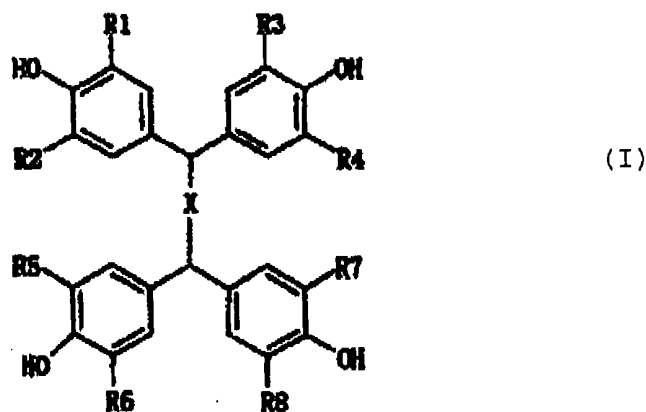
#### 3. New claims 15 to 22

The new claims recite the invention regarding the curing of a non-curative epoxy resin using the clathrate wherein TEP is used as a host compound and a curative (curing accelerator) as a guest compound. As described in detail in "3. Curative Property of a Clathrate Comprising a TEP as a Host and a Curative as a Guest" of "1. Remarkable Characteristics of the Present Invention" mentioned above, it is clear that the "clathrate comprising a TEP as a host compound and a curative (curing accelerator) as a guest compound" means a "clathrate comprising a TEP as a host compound and a curative (curing accelerator) as a guest compound, having a curing acceleration action of the TEP itself after the release of guest curative and a one-pack stabilization action as well. The prior arts such as JP5-194711 and the like mentioned above do not teach anything regarding said "clathrate having a curing acceleration action of the TEP itself after the release of guest curative and a one-pack stabilization action as well", and therefore, it is clear that the invention is not obvious over the prior arts such as JP5-194711 and the like mentioned above.

Although Applicants believe it is not necessary, if the Examiner is still not satisfied with the proposed new claims 15-22, Applicants are prepared to discuss with the Examiner amending claims 15 to 22 to the following alternative claims 15' to 22' to reflect and further emphasize the point mentioned above.

ALTERNATIVES TO NEW CLAIMS 15 TO 22

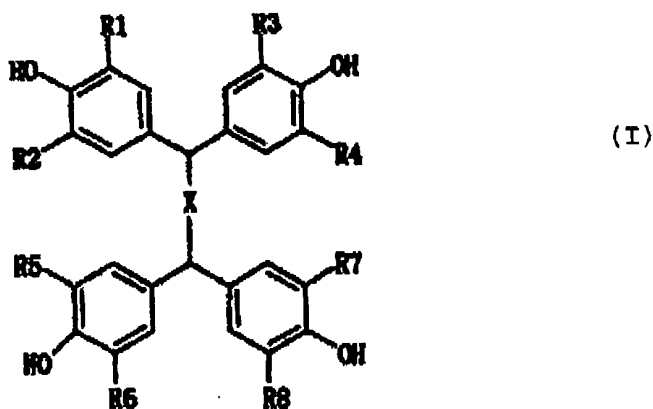
15'. (Newly added) A curative for epoxy resin, comprising a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a compound reacting with an epoxy group to cure an epoxy resin, wherein the clathrate has a curing acceleration action of the TEP itself after the release of guest curative and a one-pack stabilization action as well,



wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

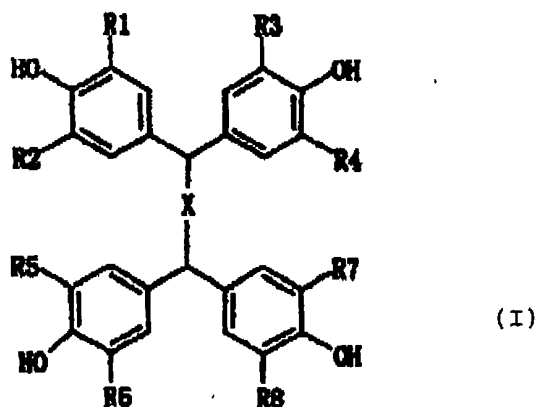
16'. (Newly added) A curing accelerator for epoxy resin, comprising a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a compound accelerating the curing of a compound reacting with an epoxy group to cure an epoxy resin,

wherein the clathrate has a curing acceleration action of the TEP itself after the release of guest curing accelerator and a one-pack stabilization action as well,



wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

17'. (Newly added) An epoxy resin composition, comprising a non-curing epoxy resin, and a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a compound reacting with an epoxy group of the epoxy resin to cure the resin, wherein the clathrate has a curing acceleration action of the TEP itself after the release of guest curative and a one-pack stabilization action as well,



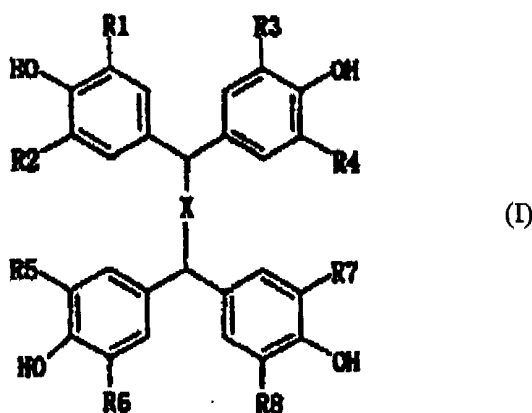
wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

18'. (Newly added) An epoxy resin composition, comprising

a non-curing epoxy resin;

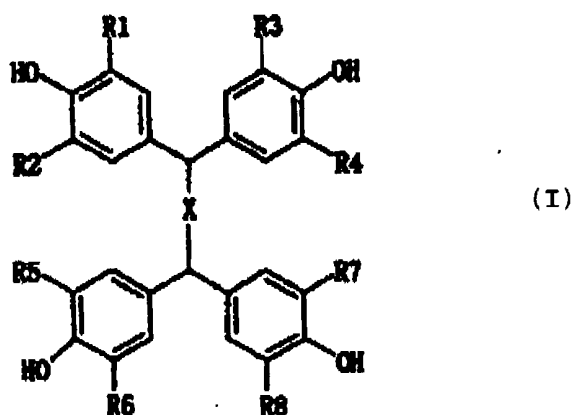
a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a compound reacting with an epoxy group of the epoxy resin to cure the resin, wherein the clathrate has a curing acceleration action of the TEP itself after the release of guest curative and a one-pack stabilization action as well; and

a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a compound accelerating the curing of a compound reacting with an epoxy group to cure an epoxy resin, wherein the clathrate has a curing acceleration action of the TEP itself after the release of guest curing accelerator and a one-pack stabilization action as well.



wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

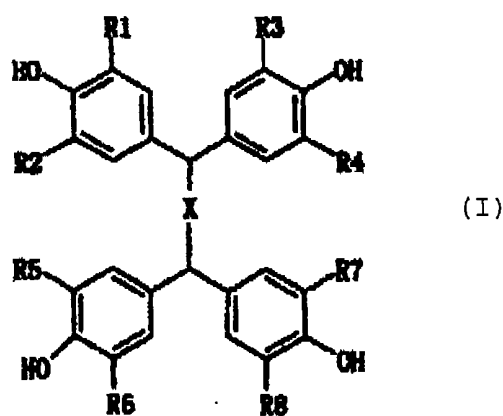
19'. (Newly added) An epoxy resin composition according to claim 17' or 18', wherein the content of a tetrakisphenol compound represented by a general formula (I) in the clathrate is in a range of from 0.001 to 0.1 mole based on 1 mole of the epoxy group,



wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

20'. (Newly added) A method for curing an epoxy resin composition comprising the steps of:

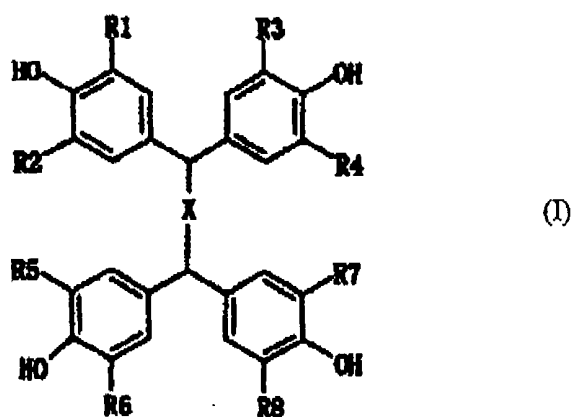
a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a compound reacting with an epoxy group of the epoxy resin to cure the resin, wherein the clathrate has a curing acceleration action of the TEP itself after the release of guest curative and a one-pack stabilization action as well, is added and mixed to a non-curing epoxy resin, and then the mixture is heated to a predetermined temperature,



wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

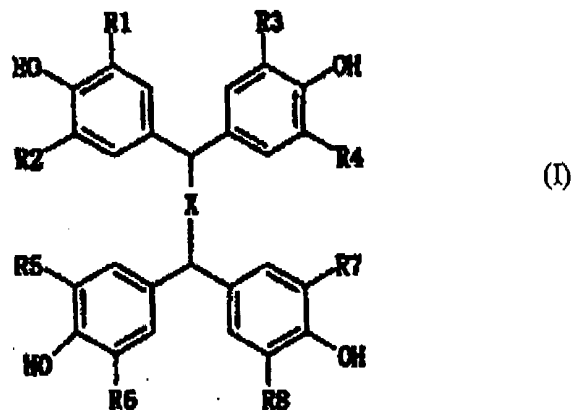


21'. (Newly added) A method for curing an epoxy resin composition comprising the steps of:  
a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a compound reacting with an epoxy group of the epoxy resin to cure the resin, wherein the clathrate has a curing acceleration action of the TEP itself after the release of guest curative and a one-pack stabilization action as well, and a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a compound accelerating the curing of a compound reacting with an epoxy group to cure an epoxy resin, wherein the clathrate has a curing acceleration action of the TEP itself after the release of guest curative and a one-pack stabilization action as well, are added and mixed to a non-curing epoxy resin, and the mixture is heated to a predetermined temperature,



wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

22'. (Newly added) The method for curing an epoxy resin composition according to claim 20' or 21', wherein the content of the tetrakisphenol compound represented by a general formula (I) in the clathrate is in a range of from 0.001 to 0.1 mole based on 1 mole of the epoxy group,



wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

#### 4. Regarding other issues alleged by the Examiner

(1) The Examiner states in the Final Office Action that the closest prior art to the TEP is the bisphenol A, which has two phenolic moieties. It is stated that the solid valid comparison

involves Sample No. 32 vs. Sample No. 54 (described in Example 7 and Comparison Example 7 of the specification for the present invention), however, testing only of this single type does not establish the criticality of the other various species within the ambit of the claims.

First, regarding the similarity with TEP based on the number of phenols, a comparative test of a TEP clathrate compound and a BPA clathrate compound as pointed out by the Examiner, has been conducted also by the present inventors while on their way to complete the present invention. The present inventors discovered that it is possible to produce a clathrate compound comprising TEP and 2MZ, 2EMZ or EDA (shown in the Example). On the other hand, it was possible to produce a clathrate compound comprising BPA and 2MZ, but not a clathrate compound comprising BPA and 2EMZ or EDA. Therefore, there is a circumstance that the comparison of BPA clathrate compound and TEP clathrate compound is limited in the first place.

(2) Further, the Examiner states as follows:

Regarding the molar ratio of clathrate: epoxy resin, claims 6, 9 and 10 expresses the molar ratio of the clathrate based on 1 mole of the epoxy group is 0.1 - 0.001. On the other hand, in the test described in Table 1 of the Amendment B, the ratio of clathrate based on 1 mole of the epoxy group is 0.1 mole. Therefore, it is unclear whether the test results support all the scope of the clathrate being 0.1 - 0.001 based on 1 mole of the epoxy resin described in the claims.

In order to further clarify the point where catalysis in a curing acceleration of the TEP itself is used, which is the most remarkable characteristic of the present invention, claims 6 to 10 were deleted and new claims 11 to 22 have been added. The invention in the new claims 11 to 22 that have been added refers to an invention using "catalysis in a curing acceleration of the TEP itself", which is a novel knowledge. It is clear that novelty and non-obviousness are found in this invention, as explained above. In the present invention, in order to particularly emphasize the "catalysis in a curing acceleration of the TEP itself", claims 19 and 22, which describes the limit that the content of the TEP in the clathrate is in a range of from 0.001 to 0.1 mole based on 1 mole of the epoxy group. However, numerous U.S. patents exist, which had been allowed without the limit of the amount of the catalyst used. Nor have we heard of cases pointing out the support the lower limit of the amount of catalyst used. Therefore, the issue regarding this matter pointed out by the Examiner is not advisable.

#### IV. Advisory Action

##### 1. Reply to the Examiner's points

(1) As the Examiner notes that "[n]one of the previously considered claims dealt with the new issue of defining the claimed tetrakisphenol itself as a curing accelerator" (lines 2 to 3 on p. 2 of the Advisory Action), Applicants admit that the novel claims 11 to 22 relate to new issues.

(2) The Examiner's point that "[n]ew claims 11 to 22 are indefinite since there is no depicted structure for general formula (I)" (lines 3 to 4 on p. 2 of the Advisory Action), is a quite reasonable comment, and therefore we amended the novel claims 11 to 22 following the points made by the Examiner.

(3) The Examiner notes that "[t]welve new claims have been presented while only five claims have been cancelled" (line 5 on p. 2 of the Advisory Action). Although Applicants do not understand such a prohibition, the claims are re-presented and must now be considered as part of this RCE application.

(4) As to the Examiner's point that "[t]he comparisons referred to on page 8 of the amendment are inconclusive since it cannot be ascertained whether the relative amounts of curative or curing accelerator, and host compound have been held constant to isolate the effect of the claimed tetrakisphenol host compound over the closest prior art bisphenol A of Japanese '711 (page 15, paragraph 14, item (14)), the 1,1-bis(4-hydroxyphenyl)cyclohexane (specification, page 26, BHC) of Sample Nos. 53, 50 and 48, and the bisphenol S (BPS) of Sample No. 55 are not representative of the closest prior art bisphenol A of Japanese '711" (second paragraph on p. 2 of the Advisory Action). We would respectfully ask the Examiner to understand that a comparison

of a clathrate compound comprising BPA and a clathrate compound comprising TEP is restricted in the first place.

(5) As to the Examiner's point that "[f]urther, it is unclear whether the results are reflective of the different type of host compound or the diverse processes of preparation" (lines 14 to 15 on p. 2 on p. 2 of the Advisory Action), a large number of examples (47 examples) are described in Tables 1 and 2 of the specification.

(6) As to the Examiner's point that "[t]he samples utilizing the claimed tetrakisphenol were prepared by two different methods as described on page 21 of the specification, whereas the samples allegedly representative of the prior art were obtained via the procedures set forth in the references cited on pages 26-27, references (1) to (5)" (lines 15 to 19 on p. 2 on p. 2 of the Advisory Action), Applicants are not certain whether they fully understand the point being made by the Examiner. However, Applicants believe that the Examiner's question will be answered by the following comment.

The specification described a method of producing a clathrate in the following way (lines 11 to 26 on page 21 of the specification):

When a curative or a curing accelerator is in liquid s[t]ate under a room temperature, 10 parts by weight of wither the curative or the curing accelerator was added with 1 parts of a host compound and was subsequently stirred for 1 to 120 min. under a temperature of from 25 to 100 °C, and the mixture was then allowed to stand for 1-48 hours to precipitate the crystals. After taking out the crystals by filtration, the crystals were dried under reduced pressure at a temperature of a room temperature to 80 °C to obtain the clathrate according to the present invention. Whereas, when a curative or a curing accelerator is in solid state, it was mixed with a host compound at a specific mole ratio, and the mixture was then kneaded in a mortar for one hour to obtain the clathrate according to the present invention. The method mixing wither a curative or a curing accelerator and a host compound is hereinafter simplified by using a term "Neat".

Further, it is shown in Table 1 that there are cases where the mole ratios are the same using a specific host compound and a specific guest compound (curative or curing accelerator) (such as in Sample Nos. 28 and 29, 35 and 36, 37 and 38), and there are cases where the mole ratios are different if different production methods are employed (such as in Sample Nos. 19 and 20, 24 and 25, 26 and 27).

However, since the most remarkable characteristic of the present invention is that TEP itself can be used as a catalyst for curing acceleration, in Example 2 and Comparison Example 2 (Table 4; curative: 2MZ), Example 3 and Comparison Example 3 (Table 5; curative: 2E4MZ), Example 4 and Comparison Example 4 (Table 6; curative: EDA), and Example 5 and Comparison Example 5 (Table 6; curative: 2PLZ) relating to "measurement of prolonged pot life of resin compositions", and in Example 7 and Comparison Example 7 (curative: 2MZ), Example 8 and Comparison Example 8 (curative: 2E4MZ), Example 9 and Comparison Example 9 (curative: EDA), Example 10 and Comparison Example 10 (curative: 2PLZ) relating to "measurement of curing temperature of resin composition", the amounts of curatives (2MZ, 2E4MZ, EDA, 2PLZ) are adjusted to 4.0 parts by weight in both Examples and Comparison Examples in order to avoid the effects by each curative (2MZ, 2E4MZ, EDA, 2PLZ).

On the other hand, as seen from "Table 3" of the specification of the present invention, in the clathrates in the references (1) to (5), all the mole ratios of a host compound (phenol compound) and a guest compound (curative) are 1:1. However, in the clathrates of the present invention, the mole ratios of a host compound and a guest compound are 1:1.5 to 1.6 except for Sample No. 30, and therefore the amount in mole of a guest compound (curative or curing accelerator) is larger than the amount in mole of a host compound.

Therefore, in the examples and comparison examples on the "measurement of prolonged

pot life of resin compositions" or the "measurement of curing temperature of resin composition" wherein the amount of guest compound (curative) is adjusted to 4.0 parts by weight, it is evident that the moles of host compounds (phenol compounds) in the clathrates of references (1) to (5) are smaller than the moles of host compounds (TEP) in the clathrates of the present invention. The fact that TEP, which is smaller than the phenol compounds in mole shows excellent effects in the "measurement of prolonged pot life of resin compositions" or the "measurement of curing temperature of resin composition" clearly indicates that the present invention characterized by "the use of TEP itself as a catalyst for curing acceleration" is not obvious from the references (1) to (5).

In a recent case before the Circuit Court of Appeals for the Federal Circuit decided on May 13, 2002, the court found that a prior art reference will NOT be assumed to inherently contain claimed property because it discloses same structure. The plaintiff in the case was attempting to have the court declare defendant's patent invalid as obvious over a prior art patent that disclosed the same structure but did not specifically disclose a 2 percent limitation for reduction of a reflection contribution. Plaintiff argued that the limitation was inherently there because the basic structure was the same. Plaintiff had not shown that the prior art taught, suggested or motivated the reduction to about 2 percent. Crown Operations International Ltd. v. Solutia Inc., 62 USPQ2d 1917 (Fed. Cir. 2002).

In the instant application, the cited references are being in effect used by the Examiner as inherently disclosing limitations not present or suggested in those references.

#### CONCLUSION

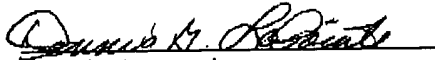
Even though the initial claims in this important patent application were drawn to a new, useful and nonobvious invention, they have now been canceled and replaced with new claims 11-22. Applicants respectfully submit that claims 11-22 are patentable over the art of record.

A Notice of Allowance is earnestly solicited.

If the Office is not fully persuaded as to the merits of Applicant's position, or if an Examiner's Amendment would place the pending claims in condition for allowance, a telephone call to the undersigned at (727) 538-3800 would be appreciated.

Very respectfully,

Dated: 10/30/02

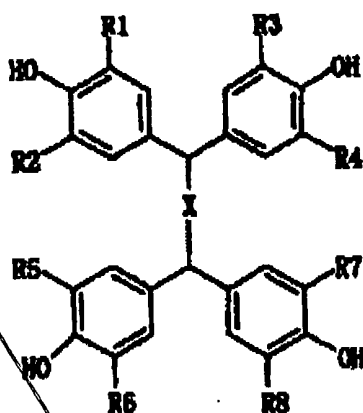
  
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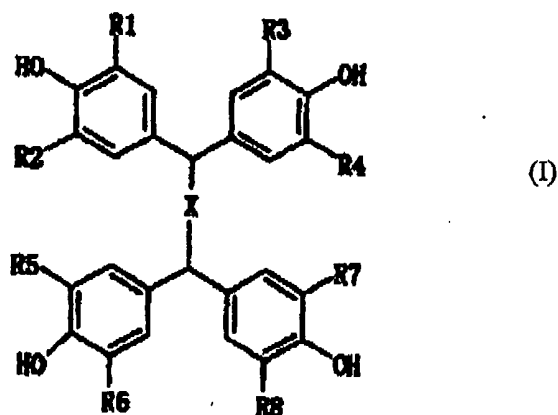
NEW CLAIMS 11-22

11. An epoxy resin composition comprising a non-curing epoxy resin, a non-clathrated curative agent reacting with an epoxy group of the epoxy resin to cure the resin, and a tetrakisphenol compound represented by a general formula (I) as a curing accelerator catalyst,



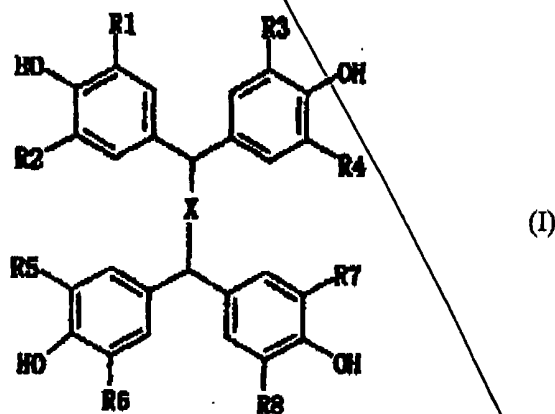
wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

12. The epoxy resin composition according to claim 11, wherein the content of the tetrakisphenol compound represented in general formula (I) is a range from 0.001 to 0.1 mole based on 1 mole of the epoxy group,



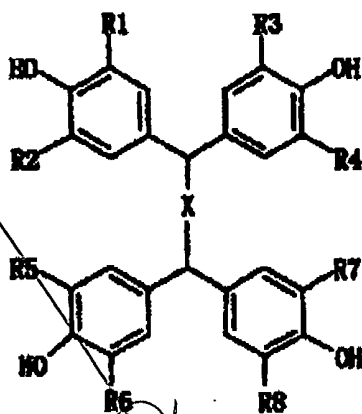
wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

13. A method for curing an epoxy resin comprising a step of mixing a non-clathrated curative agent reacting with an epoxy group of the epoxy resin to cure the resin, and a tetakisphenol compound represented by a general formula (I) as a curing accelerator catalyst with a non-curing epoxy resin,



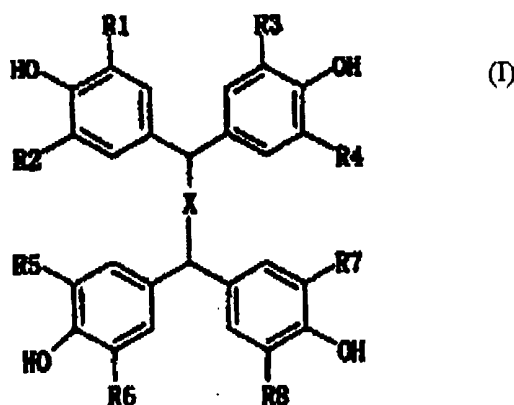
wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

14. A method for curing an epoxy resin according to claim 13, wherein the content of the tetrakisphenol compound represented in general formula (I) is a range from 0.001 to 0.1 mole based on 1 mole of the epoxy group,



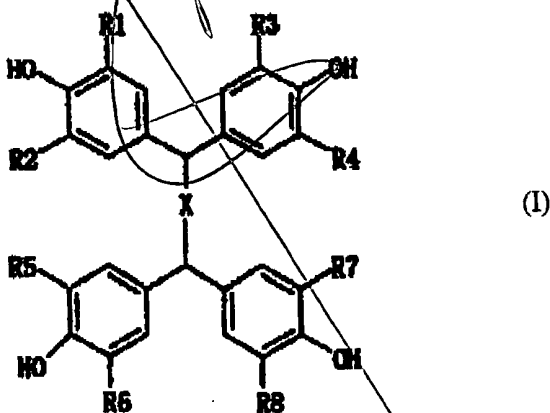
wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

15. A curative for epoxy resin, comprising a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a compound reacting with an epoxy group to cure an epoxy resin,



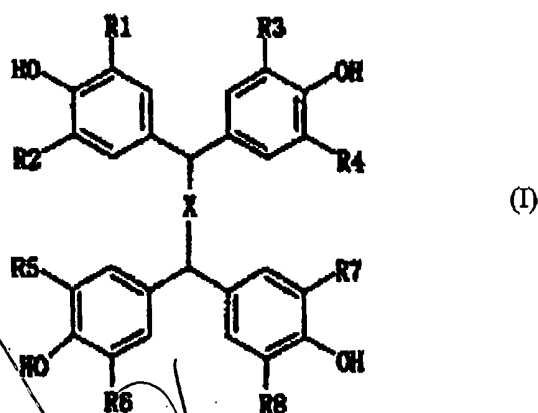
wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

16. A curing accelerator for epoxy resin, comprising a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a compound accelerating the curing of a compound reacting with an epoxy group to cure an epoxy resin,



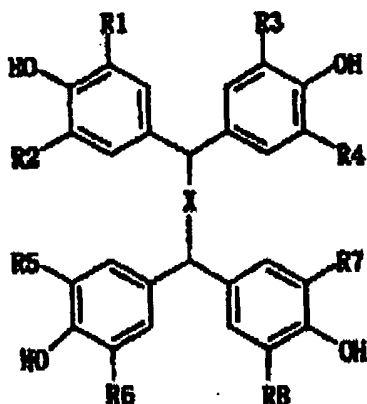
wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

17. An epoxy resin composition, comprising a non-curing epoxy resin, and a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a compound reacting with an epoxy group of the epoxy resin to cure the resin,



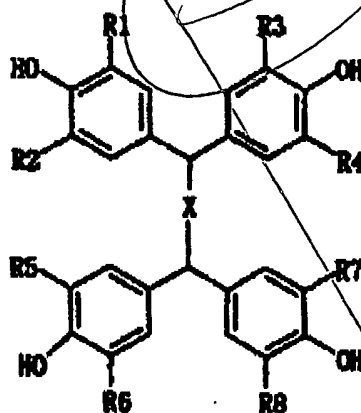
wherein X represents  $(CH_2)_n$ ,  $n$  is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

18. An epoxy resin composition, comprising a non-curing epoxy resin; a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a compound reacting with an epoxy group of the epoxy resin to cure the resin; and a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a compound accelerating the curing of a compound reacting with an epoxy group to cure an epoxy resin,



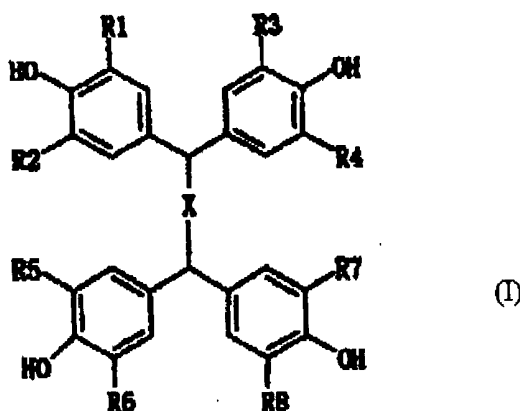
wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

19. An epoxy resin composition according to claim 17 or 18, wherein the content of a tetrakisphenol compound represented by a general formula (I) in the clathrate is in a range of from 0.001 to 0.1 mole based on 1 mole of the epoxy group,



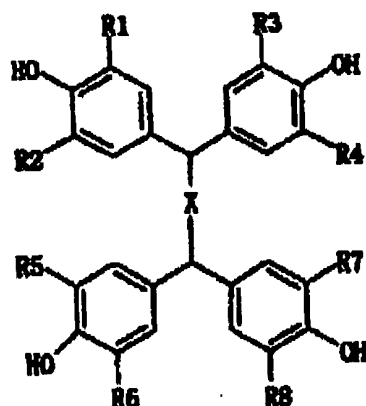
wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

20. A method for curing an epoxy resin composition comprising the steps of:  
 a clathrate comprising a tetrakisphenol compound represented by a general formula (I) and a  
 compound reacting with an epoxy group of the epoxy resin to cure the resin is added and mixed  
 to a non-curing epoxy resin, and then the mixture is heated to a predetermined temperature,



wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

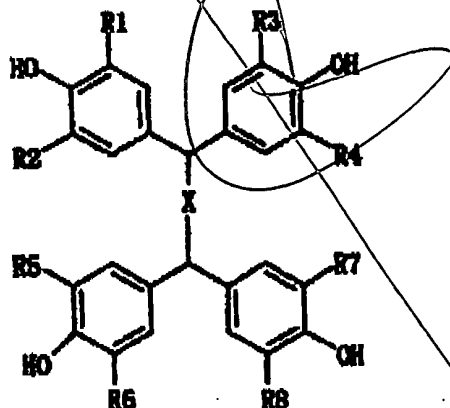
21. A method for curing an epoxy resin composition comprising the steps of:  
 a clathrate comprising a tetrakisphenol compound represented by a general formula (I)  
 and a compound reacting with an epoxy group of the epoxy resin to cure the resin, and  
 a clathrate comprising a tetrakisphenol compound represented by a general formula (I)  
 and a compound accelerating the curing of a compound reacting with an epoxy group to cure an  
 epoxy resin are added and mixed to a non-curing epoxy resin, and then the mixture is heated to a  
 predetermined temperature,



(I)

wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.

22. The method for curing an epoxy resin composition according to claim 20 or 21, wherein the content of the tetrakisphenol compound represented by a general formula (I) in the clathrate is in a range of from 0.001 to 0.1 mole based on 1 mole of the epoxy group.



(I)

wherein X represents  $(CH_2)_n$ , n is 0, 1, 2, or 3, and  $R^1$  to  $R^8$  each represents hydrogen, a lower alkyl, optionally-substituted phenyl, halogeno or a lower alkoxy.